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25 October 1991

EG&G, Rocky Flats  
P.O. Box 464  
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ATTN: Mark Burmeister

Subject: Long-Term Slope Stability  
881 Hillside French Drain Installation  
Roy F. Weston, Inc. (WESTON) Work Order No. 2029-33-01

Dear Mr. Burmeister:

At your request, WESTON has prepared the following response to slope stability concerns raised by Mr. Simonson of the Department of Energy (DOE) in his October 9, 1991, memorandum. Mr. Simonson's raised concerns regarding whether "Hillside slumping and its impact on the drain (lifetime operation)" had been properly addressed. The following brief discussion provides WESTON's opinions regarding this subject.

- WESTON obtained aerial photographs of the Rocky Flats Plant Site taken in 1937 prior to any construction activities. The photos were used to prepare a topographic map (Figure 2-2, French Drain Geotechnical Report). Review of the photos and the resultant map did not identify any sloping having occurred from 1937 to the present on the 881 Hillside. This observation does not rule out future movement. However, an inference can be made that the 881 Hillside "appears" more stable than other slopes that were observed to have undergone slumping.
- Any remedial technology that requires a long-term physical presence on the site (i.e., wells, connecting pipelines, pump or blower installations) will be susceptible to movement.
- One of the primary causes of soil movement (landslides) is an increase in pore pressure within the soil. This increase in ("water") pressure results in a decrease in the shear strength or sliding resistance of the soil. One of the most common and recommended techniques to reduce pore pressure (increase sliding resistance) is to install a drain through the primary slip surface. This slip surface is most often the soil/bedrock contact. By installation of the French Drain on the 881 Hillside, using the construction techniques recommended in the WESTON report, significant increases in shear strength along the soil/bedrock interface will occur. Documentation of these techniques and procedures can be found in the "Standard Handbook for Civil Engineers," Frederick S. Merritt, Editor, McGraw-Hill Book Company, 1983.
- Section 4.1.3 of the WESTON "French Drain Geotechnical Report" is entitled "Evaluation of Slump Feature Characteristics and Their Potential Impact on French Drain Construction." In this section WESTON evaluated the type and size of the slumps that might occur on the 881 Hillside. This evaluation is based upon mapping of 34 active or recent slumps on the Rocky Flats Plant site. Using the data, the average volume of a slump that is most likely to occur on 881 Hillside is approximately 370 cubic yards. It would cover an area of approximately 3,200 square feet with a length of 44 feet and a width of 75 feet.

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- If a slump of this size were to occur along the French Drain alignment, operation of the drain would be adversely affected. However, the size of the potential slump is not significant when accompanied by the entire alignment. Therefore, it is WESTON's opinion that repairs to the drain could be easily made within a relatively short time frame.
- To aid DOE with their assessment, WESTON has made the following estimate of costs to repair the drain if a "typical" 370-cubic-yard slump were to occur. These costs include the earthwork necessary to excavate and replace the failed area with the appropriate material. Additionally, the cost to weld the liner and repair and replace the collection pipe are included. A 50% surcharge is added in the estimate to allow for anticipated cost escalation due to the normal work requirements of the site. To allow for the uncertainties associated with cost estimates and include an appropriate figure to re-stabilize the slump, a volume of 800 cubic yards was utilized for the estimate. Using these assumptions, WESTON conservatively estimates that \$110,000 would be required to repair a "typical" slump occurring along the French Drain alignment. Furthermore, it is our estimate that repairs could be performed within 10 to 20 working days.

WESTON cannot provide total assurance that slumping along 881 Hillside will not occur and if it occurs, that slumping will not affect operation of the French Drain. However, it is our opinion that long-term slope stability is likely and, that if movement resulting in a "typical" landslide were to occur, relatively inexpensive and timely repair activities could be conducted.

We appreciate the opportunity to be of service to you. Should you have any questions regarding this letter, please feel free to contact the undersigned.

Sincerely,

ROY F. WESTON, INC.

Michael A. Anderson, Ph.D., P.E.  
Vice President

Greg D. Sherman, P.G.  
Project Manager

MAA/GDS/mf  
cc: Project File